COASTAL PLAIN SEMIPERMANENT IMPOUNDMENT (TYPIC MARSH SUBTYPE)

Concept: Coastal Plain Semipermanent Impoundment communities are ponded wetlands produced by beaver dams or by long-established man-made dams that produce similar ponds. They include drained impoundments whose vegetation remains distinct from other floodplain communities. The Typic Marsh Subtype encompasses shallow water and saturated portions of ponds dominated by emergent herbaceous marsh vegetation in the Coastal Plain outside of the Sandhills. It is both a zonal community in active ponds and a successional community in drained ponds.

Distinguishing Features: Coastal Plain Semipermanent Impoundment communities are distinguished by occurrence in the Coastal Plain in active or recently drained beaver ponds or in artificial ponds that have a similar environment and vegetation. Drained beaver ponds are treated as Semipermanent Impoundments until they become more similar to another floodplain community. Young shrub and sapling stands are treated as the Typic Marsh Subtype until they form a recognizable forested community.

The Typic Marsh Subtype is distinguished from other subtypes by the dominance of emergent herbaceous or shrub vegetation and the lack of a substantial tree canopy. *Salix* or other early successional small trees may be present, and *Taxodium distichum, Nyssa biflora,* or *Nyssa aquatica* may be present as scattered trees. The Typic Marsh Subtype is distinguished from the Sandhills Marsh Subtype by substantial floristic differences that correlate with nutrient richness and mineral or boggy character. Species indicative of the Typic Marsh Subtype and not typical in the Sandhills Marsh Subtype include most *Persicaria* spp., *Typha latifolia, Leersia hexandra, Saururus cernuus, Cladium jamaicense, Sacciolepis striata, Scleria muhlenbergii*, and *Rhynchospora macrostachya*. Species indicative of the Sandhills Marsh Subtype include *Schoenoplectus subterminalis, Eriocaulon decangulare, Carex glaucescens, Carex striata,* most *Eleocharis* spp., *Schoenoplectus etuberculatus, Orontium aquaticum,* and *Sphagnum* spp.

Synonyms: *Polygonum (hydropiperoides, punctatum)* - *Leersia* spp. Herbaceous Vegetation (CEGL004290).

Ecological Systems: Atlantic Coastal Plain Small Brownwater River Floodplain Forest (CES203.250). Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249). Atlantic Coastal Plain Brownwater Stream Floodplain Forest (CES203.248). Atlantic Coastal Plain Blackwater Stream Floodplain Forest (CES203.247).

NVC associations that could partially overlap this subtype include *Cephalanthus occidentalis / Carex* spp. - *Lemna* spp. Southern Shrubland (CEGL002191); *Alnus serrulata* Saturated Southern Shrubland (CEGL003912); *Juncus effusus* Seasonally Flooded Herbaceous Vegetation (CEGL004112); *Scirpus cyperinus* Seasonally Flooded Southern Herbaceous Vegetation (CEGL003866); *Zizaniopsis miliacea* Coastal Plain Slough Herbaceous Vegetation (CEGL004139); *Typha (angustifolia, latifolia)* - *(Schoenoplectus* spp.) Eastern Herbaceous Vegetation (CEGL006153) (unlikely to be in NC, mainly a northern association). The NVC associations do not distinguish natural and pseudo-natural impoundments from artificial lakes and

from other natural basins, apparently even from tidal rivers; hence the correspondence is only partial.

Sites: The Typic Marsh Subtype occurs on floodplains of blackwater or brownwater streams or rivers, rarely on tidal creeks. Beavers prefer second order streams (Snodgrass 1997), but they can use smaller or larger streams. On larger river floodplains, beavers dam sloughs or outlets of backswamps. While they strongly prefer low gradient streams, very few streams in the Coastal Plain have high enough gradients to deter them. The Typic Marsh Subtype usually occurs on the edges of beaver ponds or in beds of recently drained ponds, but it may occasionally occupy most of an active pond.

Soils: Coastal Plain Semipermanent Impoundments can occur on any floodplain soil, though impoundment presumably modifies the preexisting soil if the pond lasts very long. Kroes and Bason (2015) noted that ponds could be significant repositories for carbon storage, and that, though sediments in channels tended to wash out quickly if the dam was breached, sediment stored in floodplains might remain in place for centuries. If enough sediment accumulates, the soil left behind when the pond drains may be higher and drier than what existed on the site before.

Hydrology: The Typic Marsh Subtype may be permanently or nearly permanently flooded to shallow depths, may draw down during dry seasons, or may be unflooded but permanently saturated. Drained or partially drained ponds may have no standing water.

Vegetation: The vegetation of the Typic Marsh Subtype is dominated by emergent herbaceous plants. The species composition is extremely variable and is not well documented. Species that have been noted as patch dominants or as abundant in some sites include *Sparganium americanum*, *Persicaria hydropiperoides*, *Persicaria densiflora*, *Persicaria punctata*, *Persicaria sagittata*, *Leersia hexandra*, *Panicum hemitomon*, *Saururus cernuus*, *Typha latifolia*, *Rhynchospora macrostachya*, *Scleria muehlenbergii*, *Sacciolepis striata*, *Cladium jamaicense*, and the exotic species *Murdannia keisak* and *Microstegium vimineum*. Other species noted as present in as many as three of the 11 recorded species lists in Natural Heritage Program files include *Peltandra virginica*, *Juncus effusus*, *Typha latifolia*, *Persicaria sagittata*, *Boehmeria cylindrica*, *Saururus cernuus*, and *Decodon verticillatus*. Other herbaceous species include *Hypericum walteri*, *Impatiens capensis*, *Glyceria striata*, *Persicaria hastata*, *Lycopus virginicus*, *Carex gynandra*, *Rhexia virginica*, *Rhynchospora scirpoides*, *Galium aparine*, *Dulichium arundinaceum*, and *Ludwigia leptocarpa*. Aquatic species such as *Nymphaea odorata* may be present in small numbers amid the emergent vegetation or in small pools. Woody plants may be absent, may consist of sparse trees and shrubs remaining from before impoundment, or may consist of sparse-to-dense young individuals invading the marsh. They usually are generalist species of open wetlands, such as *Alnus serrulata*, *Cornus stricta*, *Cephalanthus occidentalis*, *Salix nigra*, *Salix caroliniana*, and *Rosa palustris*, or water-tolerant trees such as *Acer rubrum* var. *trilobum* and *Nyssa biflora*.

Range and Abundance: Ranked G4?. This community may be found wherever streams or rivers occur in the Coastal Plain, though they are scarce or absent in the Sandhills Region. Similar communities may occur in all the southeastern states. Beaver ponds are scarce in the outer Coastal Plain and are more abundant in the northern inner and middle Coastal Plain. This may be simply related to stream density but could also reflect locations of reintroduction and recent spread.

Associations and Patterns: The Typic Marsh Subtype usually occurs with other subtypes, as an edge or upper end zone. In channel ponds (see Krues and Bason 2015), open water may be limited and marsh may make up most of the pond. Coastal Plain Semipermanent Impoundments in general are bordered by floodplain communities. The Typic Marsh Subtype often also borders upland communities of various types.

Variation: This subtype, as currently defined, is one of the most variable in the state, both in differences among sites and in heterogeneity within sites. However, patterns have not been identified in the vegetational variation. Vegetation often appears to consist of patches or zones dominated by a single species, but other areas may have the same species intermixed. True monocultures are not common, and most are not a large proportion of the marsh area. Two variants are tentatively recognized based on presumed functional differences:

1. Active Pond Variant occurs in ponds where beavers are present and maintaining the dam.
2. Successional Pond Variant occurs in abandoned ponds that have drained. Vegetation often is newly established in what was the Open Water Subtype or, in older examples, invading shrub and tree saplings are present. Other vegetational differences between these variants are not well known, but *Leersia virginica*, *Kellochloa* (*Panicum*) *verrucosa*, *Persicaria sagittata*, and the exotic species are some that are more likely to be abundant in successional examples.

Other likely sources of variation that could lead to variants or subtypes include blackwater versus brownwater, small versus large floodplains, association with organic soils, and distance from the coast. Water depth or wetness clearly is an important driver of local variation in vegetation but does not appear to be a useful basis for division given its wide range within sites. However, deeper water patches associated with old channels tend to be dominated by *Sparganium americanum*.

The physical typology of beaver ponds and pond clusters described by Krues and Bason (2015) and summarized under the Open Water Subtype may be useful.

Dynamics: See the more extensive discussion of general beaver pond dynamics under the Open Water Subtype.

These communities can form fairly rapidly when a pond is built, but they may be slower to develop than the Open Water Subtype because the shallower water may take longer to kill the existing trees. Some live trees, generally showing signs of stress, are present for some time, before they eventually succumb to the flooding or are girdled or cut by the beavers. Snags may be abundant for several years. The role of stumps and fallen logs in providing microsites for plants of drier sites is even more important in this subtype than in the deeper water. Establishment of some herbaceous vegetation can be rapid, but the community continues to develop and change in composition and diversity with time. There may be a distinct successional trajectory in the development of these communities, but it has not been described. It is unknown how much of the tremendous variability observed is related to duration of impoundment in addition to variation in flooding conditions.

The Typic Marsh Subtype may also rapidly spread into deeper parts of the pond when the dam is abandoned. While drained ponds in the North may persist as wet meadows for 50 years or more

(Wright et al. 2002), forest return is much more rapid in most of North Carolina. However, if part of the dam remains, it may retain enough water to prevent woody invasion and to allow the marsh to persist for some years.

In addition to limited knowledge of the natural abundance and duration of beaver ponds in North Carolina, and in general, there is limited knowledge of the number of examples, extent, and duration of the different subtypes. Most drained ponds probably go through a stage of marsh vegetation, but it may be short-lived. In long-lasting ponds, the marsh may be a stable zone, or may slowly succeed to the Cypress–Gum Subtype.

Comments: See the discussion on ecosystem services and landscape roles of beaver ponds, under the Open Water Subtype.

The vegetation of all Coastal Plain Semipermenent Impoundment subtypes is not well studied. Very few CVS plots exist. Sites descriptions often do not document their vegetation in great detail. In addition, many examples are relatively new and were not present at the time of older site descriptions.

The Typic Marsh Subtgype is very heterogeneous. It may need to be split into several subtypes, but these communities are not well enough known to create a useful division at present. The NVC presently has a number of wide-ranging associations described only as being dominated by single species that often occur within this subtype, as well as in other habitats. Occurrences of this subtype could therefore be treated as a fine-scale mosaic of patch or zonal subtypes, some of which would correspond to NVC associations, while many new associations would need to be defined for other patch dominant species. A better solution is likely to be a small set of subtypes/associations of mixed composition, ones that incorporate the patches but reflect broader scale differences among impoundments. Variations correlating with size of impounded stream, amount of mineral sediment vs. muck, presence of seepage, and biogeography may be a good basis for classifying these communities but are virtually unknown. Even within a region and stream type, beaver ponds vary substantially. An additional axis of variation is the cycle from new creation to maturity to abandonment and succession back to prevailing community types.

References:

Kroes, D.E. and C.W. Bason. 2015. Sediment trapping by beaver ponds in streams of the Mid-Atlantic Piedmont and Coastal Plain, USA. Southeastern Naturalist 14: 577-595.

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